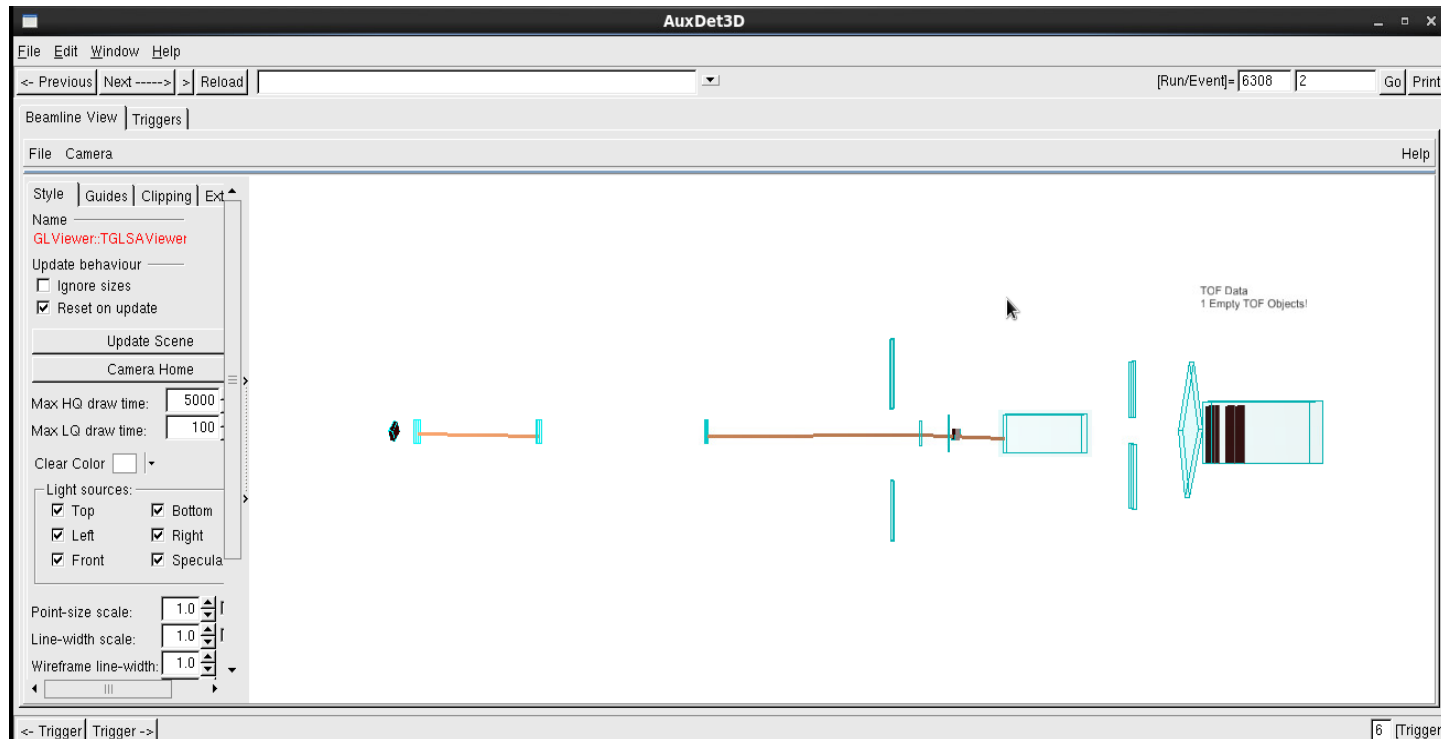# LArIAT Event Display Add-Ons

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Using the Event Display

- Log in to a lariatgpvm machine
- source /grid/fermiapp/lariat/setup_lariat.sh
- source /lariat/app/users/aolivier/larsoft_evd_debug/localProducts_larsoft_v04_16_00_debug_e7/setup
- source /lariat/app/users/aolivier/lariatEvd_v01_00_07/localProducts_larsoft_v04_09_00_e7_debug/setup
- setup lariatsoft v01_06_00 -q e7:debug
- lar -c evd_lariat<_sliced>.fcl <LArSoft file>
- To start the beamline view, select AuxDet3D from the window menu
- You can close the time versus wire view once the OpenGL view in the AuxDet3D window can be rotated to speed up event processing
- See the end of evd_lariat<_sliced>.fcl for more options

New Features

- Labels for detectors, AuxDetDigits, and WCTracks
- Click on a detector to zoom in on that detector
  - Useful for TPC
  - Useful for Wire Chambers
- Click on empty space to return to default zoom
- Use scroll wheel or equivalent to zoom in ROOT's GL Viewer
- TOF information displayed in top right corner
- Trigger histogram in separate tab

Future Work

- Add option to only show AuxDet information from the time window displayed on the trigger histogram

- Try to get changes to event display added to LArSoft so add-ons can be used on develop

- Prepare a tech note on the LArIAT event display add-ons

Backup: Hints for 3D Display

- Zooming in on a clicked detector works better with the AuxDet3D window maximized

- Trigger Histogram has 3 modes:
  - TrigHisto=1: Tries to emulate the online display by drawing in black triggers below a threshold
  - TrigHisto=2: Draws waveforms from trigger AuxDetDigits: lighter areas of waveforms are hits
  - TrigHisto=0: Do not draw the trigger histogram: jumps between events much faster

Backup: LArSoft Inheritance Details

- No changes necessary to use 3D beamline display

- Changes to include add-ons for TWQProjectionView:

  - Make destructors of TWQProjectionView and TWireProjPad virtual

  - Make TWQProjectionView::fPlanes protected instead of private to allow lariatsoft to draw LArIATTWireProjPads that derive from TWireProjPad

Backup: LArSoft Trigger Details

- Draws only data products associated with a specific trigger, provides management of and a user interface to the current trigger, and behaves like the regular LArSoft event display if 0 or 1 triggers are present

- Added a singleton class, DrawingState, to keep track of current trigger

- Added a single method to get data products for drawing, GetDataProducts, that replaces drawer-specific methods

- Added TriggerBar as user interface to DrawingState in each View object

- Added a flag in EvdLayoutOptions to prevent attempts to draw triggers and the TriggerBar

- GetDataProducts defaults to drawing all data products if there are 0 or 1 triggers in the event

Backup: LArSoft Bugs

- Fixed segmentation fault when closing classes that inherit from DisplayWindow by correcting destructor

- With above fix, event display application does not always end when all windows are closed! It must then be killed with ctrl+c

Backup: lariatsoft Details

- Wrote a LArIATEVD_module since LArSoft version is relatively simple and does not support inheritance
- Wrote LArIATTWQProjectionView and LArIATTWireProjPad to add:
  - 2D MC tracks to TWQProjectionView via LArIATSimulationDrawer
  - Lines at T0 and T0+max drift time
  - Projections of WCTracks into 2D TPC view (currently not working)
- Wrote LArIATGeometryDrawer to draw AuxDetGeometries, solid TPC volume, and TPC wireframe without grid and axes
- Wrote View3DEuler class to use TMarker3DBoxEuler that can be rotated using Euler angles and supports transparency
- Added AuxDet3DView, AuxDet3DPad, AuxDetDrawingOptions, AuxDetDigitDrawer, MWPCDrawer, and LArIATColorDrawingOptions to facilitate beamline view
- Should work with either trigger by trigger or sliced LArSoft files, but currently having trouble with TOF labels in sliced files